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Intraovarian Invasion of Smallmouth Bass Oocytes by 'Proteocephalus ambloplitis' (Cestoda)

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16. ABSTRACT

The bass tapeworm Proteocephalus ambloplites (Cestoda) has long been associated with poor reproduction in bass Micropterus sp. It has been suggested that the prevalence of this parasite in the ovaries of mature bass may be due to the rich blood supply of the ovaries. We suggest that the nutrients available in maturing oocytes may be at least equally as responsible for the abundance of the parasite in bass ovaries. We further suggest that, in addition to the scar tissue formed by parasitic invasion, direct oocyte destruction may also contribute to reduced production of viable oocytes and subsequent impaired reproductive success. Two photomicrographs are provided to support these beliefs.

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Intraovarian Invasion of Smallmouth Bass Oocytes by *Proteocephalus ambloplitis* (Cestoda)

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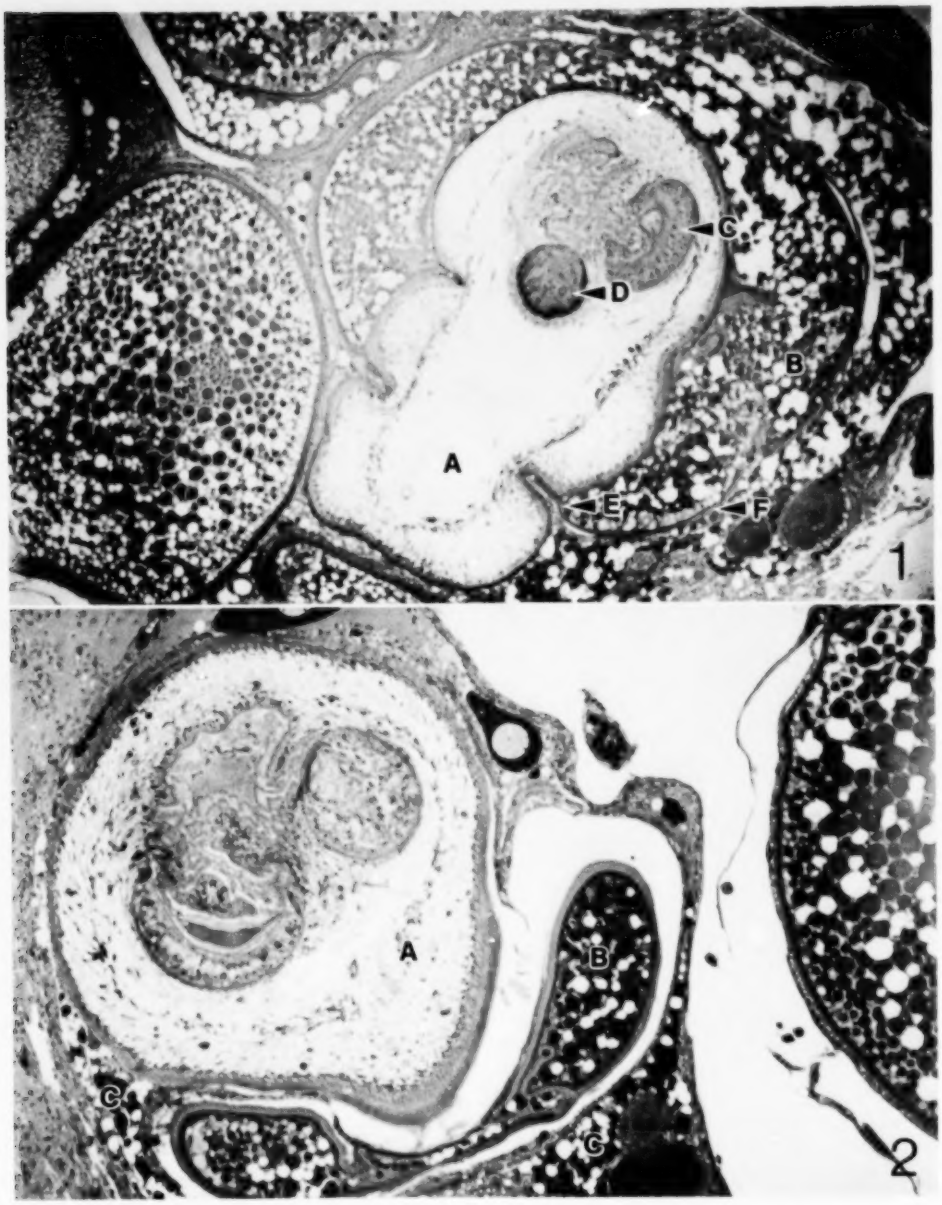
The ovaries of 41 mature smallmouth bass *Micropterus dolomieui* Lacépède from four lakes in northeastern Minnesota were examined for parasites. Bass from three of these lakes were found heavily infected with the plerocercoids of the cestode *Proteocephalus ambloplitis*. Histological preparations from the ovaries of these fish have provided new insight into how these parasites may reduce spawning success of the host.

The bass tapeworm (*P. ambloplitis*) has long been implicated in the reduced spawning success in fishes, particularly smallmouth bass (Hugghins, 1972, Agr. Exp. Sta., South Dakota St. Univ., 73 p.; Davis, 1956. Univ. Calif. Press, Berkeley and Los Angeles, 332 p.). This implication is based on reports of ovarian tissue damage (Hoffman, 1967. Univ. Calif. Press, Berkeley and Los Angeles, 486 p.), and reduced spawning success among hatchery stocks infected with the parasite (Hunter, 1928, J. Parasitol. **14:** 224–243).

In the ovaries studied, the anterior ends of plerocercoids of *P. ambloplitis* were found to have entered advanced vitellogenic oocytes (Fig. 1). This observation provided the first evidence of the direct destruction of oocytes by *P. ambloplitis* in infected fish. Destructive loss of oocytes (Fig. 1) is consistent with Holmes and Mullen's (1965, Prog. Fish-Cult. **27:** 142–145) observations "that the number of young bass produced in a body of water is inversely correlated with the incidence of the parasite." Fischer and Freeman (1969, J. Parasitol. **55:** 766–774) found that the plerocercoid of this parasite ends its parenteral stage by entering the host's intestinal tract aided by the secretion of a substance from its apical gland. We propose that this same method of penetration is employed in entering oocytes (Fig. 1).

It has been postulated that ovarian tissue is "better adapted for growth of the worms than other organs, possibly on account of the more abundant blood supply" (Hunter and Hunninen, 1934, *in* Davis, 1956, loc. cit.). However, our observations suggest that better growth of plerocercoids in ovarian tissue of sexually mature bass (Fischer, 1972, Ph.D. Thesis, Univ. Toronto) may be the result of the rich nutrient source of the maturing oocytes at least as much as to the abundant blood supply. Destruction of the oocytes (Fig. 1) makes the yolk material available not only to that portion of the parasite within the oocyte, but also to the remainder of the worm. As the yolk escapes the confines of the zona pellucida it bathes the remainder of the worm's absorbing surface in the highly nutrient media of the maturing oocyte (Fig. 2).



FIGURES 1, 2. Light micrographs. **1.** *Proteocephalus ambloplitis* invasion of smallmouth bass vitellogenic oocyte; A, *P. ambloplitis*; B, vitellogenic oocyte; C, suckers on scolex of *P. ambloplitis*; D, apical gland, the rostellum; E, invagination of *P. ambloplitis* where it passes through the zona pellucida of the oocyte (F); F, zona pellucida of oocyte. ×190. **2.** *Proteocephalus ambloplitis* partially bathed in free yolk material from collapsed vitellogenic oocyte. A, *P. ambloplitis*; B, collapsed bass vitellogenic oocyte; C, free yolk material from collapsed oocyte. ×257.

On the basis of these new observations, we suggest: (1) that the degree of reproductive impairment in *P. ambloplitis*-infected fish is dependent not only on loss of oogenic tissue caused by accumulation of ovarian scar tissue and fibrosis, but also by direct oocyte destruction; (2) that the growth and maturation of plerocercoids in ovarian tissue of sexually mature bass may be the result of the availability of nutrients in the yolk of vitellogenic oocytes at least as much as it is to an abundant blood supply.

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